

REMARKS

Claims 1, 5, 14, 21 and 32 have been amended. Applicants respectfully request entry of the amendments.

Claims 35 – 39 have been added. Claims 1-25 and 32-39 are pending

Claim Rejections - 35 USC §112

Claims 1-25 and 32-34 were rejected in the Office Action as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors, at the time the application was filed, had possession of the claimed invention.

Claims 1, 5, 14, 21 and 32 have been amended to recite “an oxide film formed on a portion ~~front and back surface~~ of the heat radiating substrate” as suggested by the Examiner. Support for this amendment can be found, for example, in FIG. 1B and on page 24, line 23 to page 25, line 1 of the application. No new matter has been added.

Claims 1-5, 7-12, 14, 16-19, 21, 24, 25 and 32-34 have been rejected as allegedly being unpatentable over Lee (U.S. Pat. No. 4,620,215). Claims 1, 5, 14, 21 and 32 have been amended to recite a case with the heat radiating substrate disposed within the case. The structure is described in the specification at page 18, line 21 to page 19, line 4 and shown in FIGS. 1 and 20. No new matter has been added.

The Applicants respectfully request withdrawal of the 35 U.S.C. 112 rejection of 1-25 and 32-34.

Claim Rejections - 35 USC §103

FIG. 20 shows an example of the structure of a hard disk where a flexible circuit assembly (FCA) 110 is mounted in the case 101. The FCA has a supporting member made of

aluminum (Al). Al is light and excellent in thermal conduction, and an oxide film formed on a surface may be thin and dense. The dense oxide film may inhibit the formation of a deep oxide layer on the aluminum by inhibiting oxygen from traveling through the dense oxide layer. Since the growth of the oxide film is small on the radiation substrate containing Al as the major material, the generation of particles is correspondingly small. The reduction in conductive particles can reduce malfunctions of the electronic equipment mounted in the case. In addition, a metal film containing Cu, Ag, Sn, Ni or Au as the major material can be formed on the surface of the Al to provide thermal conductivity as a heat sink. Accordingly, the combination of a heat radiating substrate of Al, an oxide film disposed thereon, and metal substrate disposed on a device as recited may help reduce oxide scattering in amended claim 1.

The heat sink of Lee does not suggest the claimed combination. For example, Figs. 3, 7, 8, 11 and 12 show a heat sink composed of Cu disposed over a substrate 60 made of ceramic, not of metal as recited in the amended independent claims.

Moreover, it is alleged in the Office Action that Lee discusses provision for using aluminum in column 1 and that the substitution of aluminum for copper is "well known" in heat sink technology as established by the prior art teachings of Lee. Contrary to this assertion, there is no discussion of aluminum whatsoever in column 1. The only mention of aluminum is in column 5, line 64, with reference to a bonding pad 73A.

Applicants maintain that the patent to Lee does not teach or suggest any heat sink containing aluminum as a major component. Lee's Figs. 3, 7, 8, 11 and 12 teach using a heat sink made of Cu. Furthermore, a description on Lee's Figs. 1 states: "A heat sink 25 is mounted on the back surface 12 of chip 10, typically by forming a gold-silicon eutectic bond 26 between the heat sink 25 and the chip 10." Nowhere in the patent to Lee is there a description that the heat sink 25 is, or could be, made of aluminum.

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). The prior art does not teach or suggest the present feature of the amended claims as indicated above. Indeed, the other parts of the patent suggest using Cu, not Al, for the heat sink.

Further, because Lee suggests using a Cu heat sink and attaching solder to this heat sink (see, for example, Fig. 7), the Lee patent would not have taught, suggested, or motivated one to use Al as a major component because it is difficult to adhere a brazing solder on aluminum (see page 22, lines 10 to 18).

Lee also does not recognize or appreciate the advantageous effects of forming an oxide film on a portion of a heat radiating substrate having aluminum as a major component as recited in the claims. An oxide film formed on Lee's copper heat sink would not be stable. When a heat sink made of Cu is exposed to a highly humid environment, fine oxide is scattered. The scattered oxide can adversely affect electronic devices provided around the heat sink. In contrast, an oxide film formed on a heat radiating substrate containing Al can be dense, and therefore, the oxide is not scattered to adversely affect the surrounding devices. Also, the use of Al instead of Cu may reduce the weight of the device.

Thus, Lee's Figs 3 to 10 as applied to copper could not be equally applied to aluminum.

Applicants respectfully request withdrawal of the 35 U.S.C. 103 rejection of claims 1, 5, 14, 21 and 32.

Claims 2-5, 6-13, 15-20, 22-25 and 33-39 depend either directly or indirectly from one of independent claims 1, 5, 14, 21 or 32 and should be allowable for at least the same reasons.

Allowable Subject Matter

The Applicants thank the Examiner for indicating that claims 6, 13, 15, 20, 22 and 23 contain allowable subject matter.

Conclusion

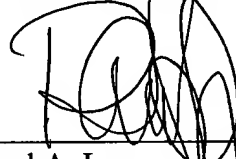
All of the pending claims as amended are in condition for allowance.

Applicant : N. Sakamoto et al.
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Enclosed is a check for \$110 as payment for the Petition of Extension of Time. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,



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